

O-T-634  
OCTOBER 8, 1945

## FEDERAL STANDARD STOCK CATALOG

## Section IV

(Part 5)

## FEDERAL SPECIFICATION

FOR

## TRICHLOROETHYLENE; TECHNICAL-GRADE

This specification was approved on the above date by the Director of Procurement, for the use of all departments and establishments of the Government, and shall become effective not later than Dec. 15, 1945, for use in procurement initiated on or after that date. It may be put into effect, however, at any earlier date after promulgation.

## A. APPLICABLE SPECIFICATION

A-1. The following Federal Specification, of the issue in effect on date of invitation for bids, shall form a part of this specification:

VV-L-791—Lubricants and Liquid-Fuels; General Specifications (Methods for Sampling and Testing).

## B. TYPES AND GRADE

B-1. Trichloroethylene, as specified herein, shall be furnished in one grade and in the following types (see notes I-1 and I-2):

Type I. Regular.

Type II. Vapor-Degreasing.

## C. MATERIAL

C-1. Trichloroethylene shall be suitable for the purposes intended and as specified hereinafter.

## D. GENERAL REQUIREMENTS

D-1. See Section E.

## E. DETAIL REQUIREMENTS

E-1. *Type I (Regular).*

E-1a. *Appearance.*—Shall be clear and free from suspended matter or sediment.

E-1b. *Color.*—The color shall be not darker than a solution containing 0.0045 gm. of potassium dichromate in one liter of distilled water.

E-1c. *Odor.*—The odor shall be characteristic; and the trichloroethylene shall leave no residual odor after drying from filter paper. (Sec par. F-2c.)

E-1d. *Specific gravity.*—Shall be not less than 1.450 nor more than 1.475 at 20°/20° C.

E-1e. *Nonvolatile matter (at 105° to 110° C.).*—Shall be not more than 0.0040 gm. per 100 ml. of the material.

E-1f. *Spot test.*—Shall pass test described in paragraph F-2f.

E-1g. *Acidity-alkalinity.*—The acidity, calculated as hydrochloric acid, shall be not more than 0.01 percent, by weight (see par. F-2g); or the alkalinity, calculated as sodium hydroxide shall be not more than 0.01 percent, by weight (see par. F-2h).

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E-1h. *Water content*.—Shall pass test described in paragraph F-2i.  
E-1i. *Distillation range*:

Initial boiling point..... Not below 86.0° C.  
End point..... Not above 90.0° C.

E-1j. *Copper corrosion*.—Shall pass test described in paragraph F-2k.

E-1k. *Free chlorine*.—Shall pass test described in paragraph F-2l.

E-2. *Type II (Vapor-degreasing)*.

E-2a. *Appearance*.—Shall be clear and free from suspended matter or sediment.

E-2b. *Color*.—Unless otherwise specified, the trichloroethylene is not required to meet the color requirement. When the color requirement is specified, the color shall be not darker than a solution containing 0.0045 gm. of potassium dichromate in one liter of distilled water; and the trichloroethylene after the stabilization test (par. F-2m) shall produce no more than a faintly discernible stain or spot when determined in accordance with paragraph F-2f.

E-2c. *Odor*.—The odor shall be characteristic.

E-2d. *Specific gravity*.—Shall be not less than 1.450 nor more than 1.475 at 20°/20° C.

E-2e. *Nonvolatile matter (at 105° to 110° C.)*.—Shall be not more than 0.020 gm. per 100 ml. of the material.

E-2f. *Acidity-alkalinity*.—The acidity, calculated as hydrochloric acid, shall be not more than 0.01 percent, by weight (see par. F-2g); or the alkalinity, calculated as sodium hydroxide shall be not more than 0.01 percent, by weight (see par F-2h).

E-2g. *Water content*.—Shall pass test described in paragraph F-2i.

E-2h. *Distillation Range*:

Initial boiling point..... Not below 85.0° C.  
At least 95 percent..... Below 90.0° C.  
End point..... Not above 95.0° C.

E-2i. *Copper corrosion*.—Shall pass test described in paragraph F-2k.

E-2j. *Free chlorine*.—Shall pass test described in paragraph F-2l.

E-2k. *Stabilization properties*.—When tested in accordance with paragraph F-2m, the material shall have an acidity of not more than 0.02 percent by weight calculated as hydrochloric acid.

#### F. METHODS OF SAMPLING, INSPECTION, AND TESTS

F-1. *Sampling*.—When practicable, original unopened containers shall be taken at random from each delivery and forwarded to the laboratory for test. When this is not practical, a representative composite sample shall be taken from each delivery, packed in clean, dry, air-tight containers, and forwarded to the laboratory. The sample shall be not less than 2 quarts, nor more than 2 gallons.

F-2. *Laboratory examination and tests*.

F-2a. *Appearance*.—Pour some of the thoroughly mixed sample into a test tube. Allow to stand for at least 10 minutes at room temperature (20° to 30° C.). Examine by transmitted light for clarity, suspended matter and sediment.

F-2b. *Color*.—Compare the color of the sample with a solution of 0.0045 gm. of reagent grade of potassium dichromate in 1 liter of distilled water. Fill 100 ml. Nessler tubes with the sample and with the dichromate solution to a height of approximately 24.5 cm. The tubes shall have a colorless bottom and the side shall be covered to eliminate side light. View the contents from a point directly above

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the tube, using a white background beneath the bottom of the tubes. Compare colors of both tubes.

**F-2c. Odor.**—Note the odor of the material. For Type I trichloroethylene, dip uniform strips of double-acid washed filter paper into the sample. Remove and allow to dry for 2 hours in a well-ventilated room, at 20° to 30° C. There shall be no residual odor at the end of the drying period.

**F-2d. Specific gravity.**—Determine at the specified temperature by any convenient method.

**F-2e. Nonvolatile matter (at 105° to 110° C.).**—Place 100 ml. of the sample in a tared porcelain evaporating dish. Evaporate over a steam bath practically to dryness. Then heat in an oven at 105° to 110° C to constant weight. Report the weight of the residue as grams per 100 ml of trichloroethylene.

**F-2f. Spot test.**—Place 5 drops of trichloroethylene in the center of a double-acid washed medium texture filter paper. The center portion of the under surface of the filter paper shall not be in contact with any object. Allow the material to evaporate, in a well-ventilated room, away from direct sunlight, at room temperature (20° to 30° C.). There shall be no stain or spot after a 2-hour drying period.

**F-2g. Acidity.**—Transfer about 25 gm. of the sample, weighed to the nearest 0.1 gm. to a 250 ml. glass-stoppered Erlenmeyer flask. Add about 25 ml. of distilled water neutralized with sodium hydroxide, using phenolphthalein indicator. Stopper the bottle and shake for 30 seconds. Add 0.01 normal sodium hydroxide from a burette until a faint pink color persists for 30 seconds. From the amount of alkali used, calculate the percent by weight of acidity in terms of hydrochloric acid. (Factor: One ml. of 0.01 normal sodium hydroxide is equivalent to 0.000365 gm. hydrochloric acid).

**F-2h. Alkalinity.**—Transfer about 25 gm. of the sample, weighed to the nearest 0.1 gm. to a 250-ml. glass-stoppered Erlenmeyer flask. Add about 25 ml. of distilled water, neutralized with sodium hydroxide using phenolphthalein indicator. Stopper the flask and shake for 30 seconds. Add 0.01 normal hydrochloric acid from a burette until the pink color disappears and fails to reappear within 30 seconds after shaking. From the amount of acid used, calculate the percent, by weight, of alkalinity in terms of sodium hydroxide. (Factor: One ml. of 0.01 normal hydrochloric acid is equivalent to 0.00040 gm. sodium hydroxide).

**F-2i. Water content.**—Place a portion of the sample in a test tube. Cool the contents to 0° C. and maintain at that temperature for 10 minutes. Examine the cooled sample by transmitted light. The material shall be clear and show no turbidity.

**F-2j. Distillation range.**—Determine the distillation range in accordance with Method 100.1 (Distillation of Gasoline, etc.) of Federal Specification VV-L-791, except that the thermometer shall be in accordance with A. S. T. M. partial immersion thermometer E1 (34C-41T), 25° to 105° C. of Method 950.1 (A. S. T. M. Standard Thermometer).

**F-2k Copper corrosion.**—Place a clean strip of mechanically polished pure sheet copper about ½ inch wide and 3 inches long in a glass tube about ¾ inch in diameter and 18 inches long. Add sufficient of the sample to completely cover the strip and heat rapidly to boiling (the use of an oil or other suitable bath maintained at a temperature slightly higher than the initial boiling point of the sample is desirable).

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Maintain at this temperature for 30 minutes without actual distillation taking place. Examine copper strip after the boiling period for discoloration. Marked blackening or iridescence (a slight tarnish shall be disregarded) of the copper strip shall be considered as not conforming to the requirements of this specification.

**F 21. Free chlorine.**—Place 25 ml. of the sample in a 250-ml. flask. Add 25 ml. of a 10 percent aqueous solution of potassium iodide, containing 0.25 ml. of starch indicator solution (see par. F-21 (1)). Shake well for 30 seconds. The aqueous layer shall be no darker than a 10 percent aqueous potassium iodide solution with the starch indicator.

**F 21 (1). Starch indicator solution.**—Mix about 2 gm. of reagent grade soluble starch or potato starch with sufficient cold water to form a thin paste. Transfer to 1 liter of boiling water, add 1 gm. of salicylic acid, and boil until the solution is clear. Cool and transfer to a glass or plastic stoppered bottle.

**F 2in. Stabilization properties (type II only).**—

**F 2in (1). Apparatus.**—See figure 1.

**F 2in (1) a. Heating arrangement.**—The heating arrangement may be as shown in Figure 1 or may be of similar arrangement provided a standard 150-watt frosted light bulb (lamp) is used.

**F 2in (1) b. Steel strips.**—S. A. E. 1020 steel strips shall be used. The strips shall be cleaned with a suitable organic solvent, polished with No. 120 emery cloth to a bright metallic surface, and again cleaned with the organic solvent. One steel strip  $\frac{1}{2}$  by  $\frac{1}{8}$  by 2 inches in size shall be suspended above the liquid (in the vapor phase). Another steel strip  $\frac{1}{2}$  by  $\frac{1}{8}$  by  $\frac{1}{8}$  inch in size shall be placed in the bottom of the flask (in the liquid phase).

**F 2in (2). Procedure.**—Place 200 ml. of the sample in the 500 ml. flask of heat-resistant glass such as Pyrex and set in the system. The oxygen delivery tube shall extend to within  $\frac{1}{4}$  inch of the bottom of the flask. The oxygen shall be saturated with water at 20° to 30° C. prior to entering the system. The oxygen flow shall be adjusted to a rate of 10 to 12 bubbles per minute through the bubble counter. The water shall be started in the condenser and so adjusted as to provide condensation only in the lower half of the condenser. The heating bath shall then be started. The test shall be run continuously for a total of 16 hours. At the end of the test, determine the acidity of the sample in accordance with paragraph F-2g. (Note: When the color requirement is specified (see par. E-2b), determine the straining properties of the trichlorethylene after the stabilization test prior to the acidity determination.)

#### II. PACKAGING, PACKING, AND MARKING FOR SHIPMENT

**(1) 1. Packaging.**—Unless otherwise specified, commercial packages are acceptable under this specification.

**(1) 2. Packing.**—Unless otherwise specified, the subject commodity shall be delivered in standard commercial containers so constructed as to insure acceptance by common or other carriers, for safe transportation, at the lowest rate to the point of delivery.

**(1) 3. Marking.**—

**(1) 3a. Issue packages.**—Unless otherwise specified, each package shall be marked with name of the material, the type, the quantity contained therein, and the name of manufacturer or contractor. The

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following statement with a "Caution" label shall appear prominently on each package:

Volatile Solvent  
Use with adequate Ventilation  
Avoid prolonged breathing of vapor

G-3b. *Shipping containers.*—Unless otherwise specified, shipping containers shall be marked with the name of the material, the type, and the quantity contained therein, as defined by the contract or order under which the shipment is made, the name of the contractor and the number of the contract or order.

H. REQUIREMENTS APPLICABLE TO INDIVIDUAL DEPARTMENTS

H-1. The following departmental specifications of the issue in effect on date of invitation for bids and special requirements shall form a part of this specification and shall be applicable to purchases made under this specification by the respective departments.

H-2. *Army.*—

H-2a. *Marking for shipment.*—

H-2a (1). *Army Service Forces.*—Shipping containers shall be marked in accordance with U. S. Army Specification No. 100-2, Standard Specification for Marking Shipments by Contractors, copies of which may be obtained without cost upon application to the procuring agency.

H-2a (2). *Army Air Forces.*—Shipping containers shall be marked in accordance with United States Army Specification No. 94-40645, Marking, Shipment, Domestic and Export copies of which may be obtained from the Office of the Commanding General in the following Army Air Forces ATSC Districts: New York, Detroit, Chicago, Wichita, Los Angeles, and Warner Robins, Georgia; or from the Director, Army Air Forces, Headquarters, Air Technical Service Command, Wright Field, Dayton, Ohio.

H-3. *Navy.*—

H-3a. *Navy Department Specifications.*—

General Specifications for Inspection of Material.

39P16—Packaging and Packing for Overseas Shipment:

Section X (JAN-P-110)----- Drums; metal, 55-gallon (for other than petroleum products).

Section XXIV (JAN-P-124)--- Cans and pails, metal.

Copies of the above-referred-to specifications and the Navy Shipment Marking Handbook may be obtained without cost upon application to the Bureau of Supplies and Accounts, Navy Department, Washington 25, D. C., except that Naval activities should make application to the Supply Officer in Command, Naval Supply Depot, Bayonne, N. J.

H-3b. *Bureau of Ships purchases.*—Such purchases should be restricted to Type II (vapor-degreasing) material. The color requirements (par. E-2b) shall apply in all purchases thereof, regardless of use for which intended (see par. 1-2).

H-3c. *Packing for domestic or overseas shipment.*—Unless otherwise specified, the subject commodity shall be furnished in 5-gallon steel pails or 55-gallon drums, as follows:

H-3c (1). Five-gallon steel pails shall conform to the requirements of Navy Department Specification 39P16, Section XXIV (JAN-P-124).

After filling, the container shall be sealed against leakage by soldering with 50-50 solder, a  $0.0149 \pm .005$  inch (28-gage) terne-plated sheet disk of proper diameter inside the neck of the opening.

H-3c (2). Fifty-five gallon drums shall conform to the requirements of Navy Department Specification 39P16, Section X (JAN-P-110).

H-3d. *Marking.*—In addition to any special marking required by the contract or order, each drum and pail shall be marked in accordance with the requirements of the latest issue of the Navy Shipment Marking Handbook.

#### 1. NOTES

I-1. Purchasers should exercise any desired options offered herein; and should specify the type required, and in the case of Type II, if required, specify the color requirements. (See par. B-1 and E-2b).

I-2. Trichloroethylene, as covered by this specification, is a technical grade intended for use as a solvent. Type I (regular) is intended for use in dry cleaning and for general solvent purposes. Type II (Vapor-degreasing) is intended for the vapor degreasing of metals.

I-3. Trichloroethylene should be used with caution and in well ventilated rooms.

I-4. It is believed that this specification adequately describes the characteristics necessary to secure the desired material, and that normally no sample will be necessary prior to award to determine compliance with this specification. If, for any particular purpose, samples with bids are necessary they should be specifically asked for in the invitation for bids, and the particular purpose to be served by the bid sample should be definitely stated, the specification to apply in all other respects.

I-5. Federal Specifications do not include all types, classes, grades, sizes, etc. of the commodities indicated by the titles of the specifications or which are commercially available but are intended to cover the types, etc., which are suitable for the Federal Government requirements.

I-6. An Index of Federal Specifications and also a Supplement-Index of Emergency Alternate Federal Specifications may be purchased as noted in the paragraph next below; prices to be obtained from the Superintendent of Documents.

I-7. Copies of this specification and of Federal Specification VV-L-791 may be obtained, upon application, accompanied by money order, coupon or cash to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price of this specification 5 cents; VV-L-791, 25 cents.

*Notice.*—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

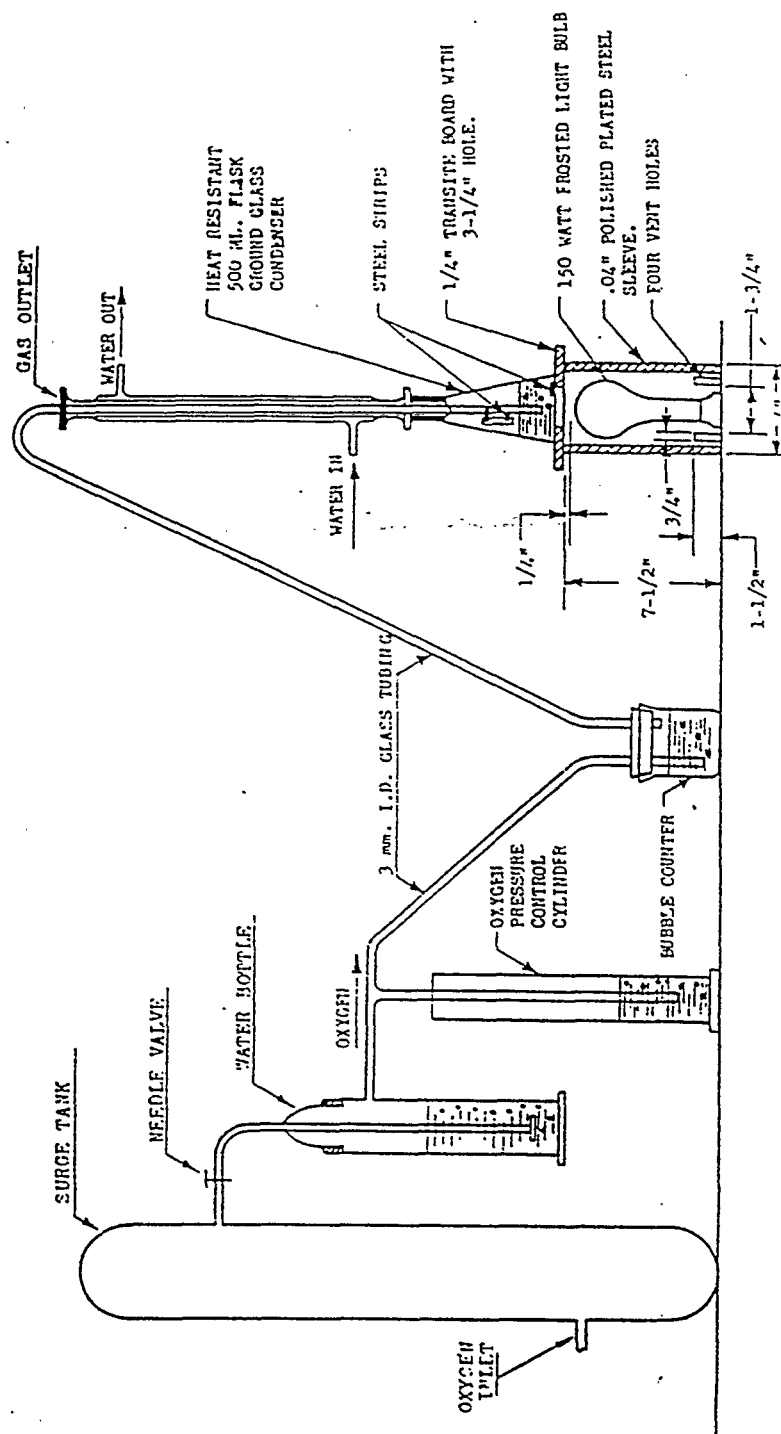


FIGURE 1.—Accelerated Oxidation Test Apparatus

U. S. GOVERNMENT PRINTING OFFICE: 1945

For sale by the Superintendent of Documents, Washington 25, D. C. Price 6 cents

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AMENDMENT—1  
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FEDERAL SPECIFICATION

FOR

**TRICHLOROETHYLENE; TECHNICAL-GRADE**

This amendment was approved on the above date by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

The following changes shall be made in Federal Specification O-T-634, dated October 8, 1945:

Page O-T-634—3:

Paragraph F-2j. Add the following sentence: "The end point shall be the temperature observed on the distillation thermometer the instant the bottom of the flask becomes dry."

Page O-T-634—5:

Paragraph G-3a (continued):

Lines 3, 4, and 5. Delete and substitute the following:

**VAPOR HARMFUL**

Use only with adequate ventilation  
Avoid prolonged or repeated breathing of vapor  
Avoid prolonged or repeated contact with skin  
Do not take internally

Pages O-T-634—5 and 6:

Paragraphs H-2a (2) through H-4. Delete and substitute paragraphs H-3 through H-4 as follows:

H-3. Navy.

H-3a. *Applicable specifications and other publications.*

*Military Specifications:*

JAN-P-110—Packaging and Packing for Overseas Shipment—Drums; Metal 55-Gallon (for Other Than Petroleum Products).

JAN-P-124—Packaging and Packing for Overseas Shipment—Containers (Cans, Pails and Drums), Metal (for Other Than Subsistence Items).

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THIS DOCUMENT CONTAINS 2 PAGES.